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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/760,661	01/15/2004	Mark L. Jones	WSC 303	1952

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/760,661	JONES ET AL.	
	Examiner	Art Unit	
	Bobby Ramdhanie, Ph.D.	1709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will; by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/26/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, 4, 6, 7, 11-18 & 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Shabani et al. Shabani et al teaches a method for quantitatively analyzing a wafer for metal impurities (Figure 2), wherein, the wafer has first and second surfaces (Figure 1), comprising: heating the first surface of the wafer to diffuse the metal impurities to the second surface in an environment at least substantially free of contamination; cooling the first surface of the wafer; and quantitatively analyzing the second surface of the wafer for the metal impurities (Page 2025 Experimental Section; Bottom first Paragraph & Abstract).

3. For Claim 3 Shabani et al teaches a method for quantitatively analyzing a wafer of Claim 1, wherein heating the first surface of the wafer includes heating the first surface of the wafer via a hotplate (Page 2027; Column 2 Bottom of 2nd paragraph).

4. For Claim 4, Shabani et al teaches the method for quantitatively analyzing a wafer of Claim 3, wherein heating the first surface of the wafer via a hotplate includes using a susceptor between the first surface of the wafer and the hotplate (Figure1 & Figure 2 and Page 2027; Column 2 Bottom of 2nd paragraph). Examiner takes the position that the clean wafer and Teflon plate both define a susceptor.

5. For Claim 6, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 1, wherein heating the first surface of the wafer includes heating the wafer in a non-oxygen containing environment (Experimental Section; Page 2025, Bottom of 1st Paragraph).

6. For Claim 7, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 6, wherein heating the wafer in a non-oxygen environment includes heating the wafer in a nitrogen gas environment (Experimental Section; Page 2025, Bottom of 1st Paragraph).

7. For Claim 11, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 1 wherein, quantitatively analyzing the second surface of the wafer includes measuring the metal impurities on the second surface (Figure 3 & Page 2026; Column 2, 3rd paragraph).

8. For Claim 12, Shabani et al teaches the method for quantitatively analyzing a wafer of Claim 1 wherein, quantitatively analyzing the second surface of the wafer includes extracting the metal impurities from the second surface (Figure 2 & Page 2026, Column 1, Paragraph in between Figure 1 and Figure 2).

9. For Claim 13, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 12 wherein extracting the metal impurities includes decomposing the second surface of the wafer and scanning an extraction solution droplet across a second surface (P. 2025 Experimental Section; 1st and 2nd Paragraphs & Figure 2 & Page 2026, Column 1, Paragraph in between Figure 1 and Figure 2).

10. For Claim 14, Shabani et al teaches the method of quantitatively analyzing a wafer of claim 12, wherein extracting the metal impurities includes adding an extraction solution droplet on the second surface and spreading the droplet across the second surface (Figure 2 & Page 2026, Column 1, Paragraph in between Figure 1 and Figure 2). Examiner takes the position that when the wafer is positioned onto the susceptor where the droplet is placed, the droplet is spread across the second surface.

11. For Claim 15, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 1, further comprising removing a native oxide layer from at least one of the first and second surfaces of the wafer (Page 2025, Experimental Section, 1st Paragraph).

12. For Claim 16, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 15, wherein removing a native oxide layer includes removing the native oxide layer by vapor phase decomposition (Page 2025, Experimental Section, 1st Paragraph). Examiner takes the position that the etching solution takes on a vapor form during the etching process and therefore is considered vapor phase decomposition.

13. For Claim 17, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 15, wherein removing a native oxide layer from at least one of the first surface and second surface of the wafer occurs before heating the first surface of the wafer (Figure 8).

14. For Claim 18, Shabani et al teaches a method for quantitatively analyzing a wafer for metal impurities, wherein the wafer has first and second surfaces, comprising: removing a native oxide layer from at least one of the first and second surfaces of the

wafer; heating the first surface of the wafer via a hotplate to diffuse the metal impurities to the second surface in an environment at least substantially free of contamination, wherein a susceptor is used between the first surface of the wafer and the hotplate (Figure 1); cooling the first surface of the wafer; and quantitatively analyzing the second surface of the wafer for impurities (Figure 2).

15. For Claim 20, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 18, wherein removing a native oxide layer includes removing the native oxide layer by vapor phase decomposition (Page 2025, Experimental Section, 1st Paragraph). Examiner takes the position that the etching solution takes on a vapor form during the etching process and therefore is considered vapor phase decomposition.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. Claims 2, 5, 19, & 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shabani et al. Regarding Claim 2, Shabani et al teaches the method for quantitatively analyzing a wafer of Claim 1. Shabani et al does not explicitly teach that the method of Claim 1 is for nickel. Shabani et al does however implicitly suggest that the method could be used for the quantitative analysis of nickel (Figures 1 & 2, & Page 2026, Column 2, 2nd Paragraph). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al because Shabani et al suggests that the method could be used for a transition metal, copper. Nickel, like copper is also a transition metal.

19. For Claim 5, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 3. Shabani et al does not teach the method of Claim 3 wherein cooling the first surface of the wafer includes switching off the hotplate and leaving the first surface of the wafer in thermal communication with the hotplate. It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al to switch off the hotplate and leave the first surface of the wafer in thermal communication with the hotplate because this would be one way for the wafer to slowly cool down to room temperature on the hot plate, this would allow for a longer period of time for the metal impurity to move to the surfaces of the wafer to be analyzed, and better reproducibility of the analysis of the metal impurities.

20. For Claim 19, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 18. Shabani et al does not explicitly teach that the method of Claim 18 is for nickel. Shabani et al does however implicitly suggest that the method could be used

for the quantitative analysis of nickel (Figures 1 & 2, & Page 2026, Column 2, 2nd Paragraph). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al because Shabani et al suggests that the method could be used for a transition metal, copper. Nickel, like copper is also a transition metal.

21. For Claim 21, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 18. Shabani et al does not teach Claim 18 wherein cooling the first surface of the wafer includes switching off the hot plate and leaving the first surface of the wafer in thermal communication with the hotplate. It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al to switch off the hotplate and leave the first surface of the wafer in thermal communication with the hotplate because this would allow the wafer to slowly cool down to room temperature on the hot plate, this would allow for a longer period of time for the metal impurity to move to the surfaces of the wafer to be analyzed, and better reproducibility of the analysis of the metal impurities.

22. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shabani et al and in view of Batchelder et al (US6544338). Regarding Claim 8, Shabani et al teaches all of the claim limitations of Claim 1. Shabani et al does not teach the method of quantitatively analyzing a wafer of Claim 1, wherein cooling the first surface of the wafer includes cooling the wafer via a cooling plate. Batchelder et al teaches this feature. Batchelder et al teaches an inverted hot plate cure module with a built in cooling plate (Abstract & Figures 3A, 9A, & 9B). It would have been obvious to one of

ordinary skill at the time the invention was made to modify Shabani et al with Batchelder et al because of the compact design and smaller size of the inverted hot plate, this would allow for a reduction of cost for equipment, and space for the experiments to be performed.

23. Claims 9 & 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shabani et al in view of Gilton (US6194326). Regarding Claim 9, Shabani et al teaches the method of Claim 1. Shabani et al does not teach cooling the first surface of the wafer includes cooling the wafer via a fluid solution. Gilton teaches this feature. Gilton teaches the use of fluid solutions for rinsing etched wafers (Abstract). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with Gilton because rinsing with fluid solution below a temperature of 0°C allows for greater control over the etching process (Abstract). Examiner takes the position that during the etching process, the temperature of the wafer increases. The rinsing fluid solution used at a temperature of 0°C, cools the wafer down.

24. For Claim 10, Shabani et al and Gilton teach all of the claim limitations of Claim 9. Shabani et al does not teach cooling the first surface of the wafer includes cooling the wafer via a fluid solution that includes ethylene glycol. Gilton teaches this feature. Gilton teaches the use of fluid solutions for rinsing etched wafers (Abstract). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with Gilton because rinsing with fluid solution below a temperature of 0°C allows for greater control over the etching process (Abstract).

25. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shabani et al in view of Shabani et al (20020101576). Regarding Claim 22, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 18, wherein quantitatively analyzing the second surface of the wafer includes performing at least one of vapor phase decomposition inductively coupled plasma-mass spectroscopy and vapor phase decomposition total x-ray fluorescence (Figure 2 and Page 2027 Column 1 1st Paragraph). Shabani et al does not teach the use of vapor phase decomposition inductively coupled plasma-mass spectroscopy. Shabani et al (20020101576) teaches the use of vapor phase inductively coupled plasma mass spectroscopy (Claims 1, 5, 6, & 7) in the quantitative analysis of silicon substrates. It would have been obvious to one of ordinary skill in the art that the time the invention was made to use vapor phase decomposition inductively coupled plasma-mass spectroscopy and vapor phase decomposition total x-ray fluorescence in the quantitative analysis of a wafer of Claim 18 because these were conventional analytical techniques present at the time of the invention.

26. Claims 23-28 & 31-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shabani et al in view of SEMI Standard M33-0998. Regarding Claim 23, Shabani et al teaches a method for quantitatively analyzing a wafer, wherein the wafer has first and second surfaces, comprising: heating the first surface of the wafer to diffuse the metal impurity to the second surface in an environment at least substantially free of contamination (Page 2025; Experimental Section): cooling the first surface of the wafer (Figure 1); and quantitatively analyzing the second surface of the wafer (Figure 2)

and that the metal impurity to be copper (Abstract). Shabani et al does not teach that the metal impurity being analyzed for is nickel. M33-0998 teaches that a method of quantitatively analyzing for metal impurities in silicon wafers to comprise both copper and nickel. It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

27. For Claim 24, Shabani et al in combination with M33-0998 teach all of the claim limitations of Claim 23. Shabani et al further teaches the method of Claim 23 wherein heating the first surface of the wafer includes heating the first surface of the wafer via a hotplate (Figure1). Shabani et al does not teach that the metal impurity being analyzed for is nickel. M33-0998 teaches that a method of quantitatively analyzing for metal impurities in silicon wafers to comprise both copper and nickel. It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

28. For Claim 25, Shabani et al in combination with M33-0998 teach all of the claim limitations of Claim 24. Shabani et al further teaches the method of quantitatively analyzing a wafer for Claim 24 wherein heating the first surface of the wafer via a hotplate includes placing a susceptor between the first surface of the wafer and the hotplate (Figure 1). Shabani et al does not teach that the metal impurity being analyzed for is nickel. M33-0998 teaches that a method of quantitatively analyzing for metal impurities in silicon wafers to comprise both copper and nickel (Abstract). It would have

been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

29. For Claim 26 Shabani et al in combination with M33-0998 teach all of the claim limitations of Claim 24. Shabani et al does not teach the method of quantitatively analyzing a wafer for Claim 24 wherein cooling the first surface of the wafer includes switching off the hot plate and leaving the first surface of the wafer in thermal communication with the hotplate or that the metal impurity being analyzed is nickel. M33-0998 teaches the method of quantitatively analyzing for metal impurities in silicon wafers to comprise both copper and nickel (Abstract). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al to switch off the hotplate and leave the first surface of the wafer in thermal communication with the hotplate because this would allow the wafer to slowly cool down to room temperature on the hot plate, this would allow for a longer period of time for the metal impurity to move to the surfaces of the wafer to be analyzed, and better reproducibility of the analysis of the metal impurities.

30. For Claim 27, Shabani et al in combination with M33-0998 teaches of the claim limitations of Claim 23. Shabani et al further teaches the method of quantitatively analyzing a wafer of Claim 23, wherein heating the first surface of the wafer includes heating the wafer in a non-oxygen containing environment (Page 2025 Experimental Section). Shabani et al does not teach that the metal impurity being analyzed for is nickel. M33-0998 teaches that a method of quantitatively analyzing for metal impurities

in silicon wafers to comprise both copper and nickel. It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

31. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shabani et al, M33-0998 and in further view of Batchelder et al (US6544338). Regarding Claim 28, Shabani et al and M33-0998 teach all of the claim limitations of Claim 23. Shabani et al and M33-0998 does not teach the method of quantitatively analyzing a wafer of Claim 23, wherein cooling the first surface of the wafer includes cooling the wafer via a cooling plate. Batchelder et al teaches this feature. Batchelder et al teaches an inverted hot plate cure module with a built in cooling plate (Abstract & Figures 3A, 9A, & 9B). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al and M33-0998 with Batchelder et al because of the size of the inverted hot plate, this would allow for a reduction of cost for equipment, and space for the experiments to be performed.

32. For Claim 31, Shabani et al teaches a method of quantitatively analyzing a wafer of Claim 23. Shabani et al further teaches the method of quantitatively analyzing a wafer of Claim 23, wherein quantitatively analyzing the second surface of the wafer includes extracting copper. Shabani et al does not teach the method of quantitatively analyzing a wafer of Claim 23, wherein quantitatively analyzing the second surface of the wafer includes extracting nickel. M33-0998 teaches this feature. M33-0998 teaches a method of quantitatively analyzing a wafer of Claim 23, wherein quantitatively analyzing the

second surface of the wafer includes extracting nickel (Abstract). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

33. For Claim 32, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 23, further comprising removing a native oxide layer from at least one of the first and second surfaces of the wafer. Shabani et al does not teach that the method of quantitatively analyzing a wafer of Claim 23, further comprising removing a native oxide layer from at least one of the first and second surfaces of the wafer made of nickel. M33-0998 teaches this feature. M33-0998 teaches that the wafer is made of nickel. It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

34. For Claim 33, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 32, wherein removing a native oxide later includes removing the native oxide layer by vapor phase decomposition. Shabani et al does not teach that the method of quantitatively analyzing a wafer of Claim 23 further comprising nickel. M33-0998 teaches this feature. M33-0998 teaches that the wafer is made of nickel. It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

35. For Claim 34, Shabani et al teaches the method of quantitatively analyzing a wafer of Claim 32, wherein removing a native oxide layer from at lest one of the first surface and second surface of the wafer occurs before heating the first surface of the wafer. Shabani et al does not teach that the method of quantitatively analyzing a wafer of Claim 32 further comprises nickel. M33-0998 teaches this feature. M33-0998 teaches that the wafer is made of nickel (Abstract). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al with M33-0998 because M33-0998 suggests the test is valid for both nickel and copper metal impurities (Abstract).

36. Claims 29 & 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shabani et al, M33-0998 and in further view of Gilton (US6194326). Regarding Claim 29, Shabani et al in cornbination with M33-0998 teach all of the claim limitations of Claim 23. Shabani et al and M33-0998 both do not teach cooling the first surface of the wafer includes cooling the wafer via a fluid solution. Gilton teaches this feature. Gilton teaches the use of fluid solutions for rinsing etched wafers (Abstract). It would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al and M33-0998 with Gilton because rinsing with fluid solution below a temperature of 0°C allows for greater control over the etching process (Abstract).

37. For Claim 30, Shabani et al in combination with M33-0998 teach all of the claim limitations of Claim 23. Shabani et al and M33-0998 both do not teach cooling the first surface of the wafer includes cooling the wafer via a fluid solution. Gilton teaches this feature. Gilton teaches the use of fluid solutions for rinsing etched wafers (Abstract). It

would have been obvious to one of ordinary skill at the time the invention was made to modify Shabani et al and M33-0998 with Gilton because rinsing with fluid solution below a temperature of 0°C allows for greater control over the etching process (Abstract).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bobby Ramdhanie, Ph.D. whose telephone number is 571-270-3240. The examiner can normally be reached on Mon-Fri 8-5 (Alt Fri off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BR

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